and the committee of the Leather Trades School. It includes also the address delivered last January at the annual distribution of prizes by Mr. Gerald Balfour. The report of the council summarises the growth in the recent activities of the institute and provides a clear statement of the precise relations of the Central Technical College with the Imperial College of Science and Technology and with the University of London. The report of the Department of Technology shows convincingly the great extent of the work accomplished by the institute in the direction of improving and extending the facilities for technical instruction throughout the country. During the session under review, that for 1907-8, 3604 classes were registered in one or other of the seventy-six different subjects in technology included in the institute's programme. These classes were held at 402 centres in 299 towns, and were attended by 48,223 students, or 2175 more than in the previous session. There are, it appears, two main causes which impede progress in the technical instruction of artisans; first, there is the difficulty of finding competent teachers, and, secondly, the unduly large proportion of artisan students who enter technical classes without the preliminary knowledge necessary to take full advantage of the instruction they receive. The report points out at the same time that there is no doubt that the teaching of technology has improved greatly during the past decade, and it is satisfactory to find that there is no relaxation of effort on the part of the institute to raise the standard of work in the classes under its care.

SOCIETIES AND ACADEMIES.
LONDON.

Physical Society, June 11.—Dr. C. Chree, F.R.S., president, in the chair.—The Arthur Wright electrical device for evaluating formulæ and solving equations : Dr **Russell** and Arthur **Wright**. Special slide resistances are used. If R be the resistance of one of these, and a metallic finger make contact with it at a point where the scale-reading is x, the resistance between this finger and the terminal of the slide is R/x. The scales are graduated as in the ordinary slide-rule. If a number of these slide resistances are connected in parallel, the sum of the currents through them will be proportional to the sum of the readings of the contact fingers. By a null method this current can be balanced against the current going through a single slide resistance X by means of a Wheatstone's bridge arrangement. The reading on X when there is a balance gives the sum of the readings on all the other slides. Similarly, numbers can be subtracted by putting slides representing these numbers in parallel with X, and then obtaining a balance by altering the reading on X. By clamping the contact fingers inclined at certain angles to a rod which can be moved at right angles to the slides, it is easy to obtain the values on X of $f(x)$ when

$$f(x) = ax^m + bx^n + cx^p + \ldots ,$$

where the indices m, n, p, ... may be positive, negative, or fractional, and the coefficients may be positive or negative numbers. A model of this device for solving an equation of any degree consisting of not more than four terms was shown. The inaccuracy of the results found by means of this model is of the order of 1 per cent. Approximate values of the imaginary roots of numerical equations can be found by the device, which can be employed also to solve very complicated equations.—The echelon spectroscope, its secondary action and the structure of the green mercury line : H. **Stansfield**. An investigation of the action of an echelon spectroscope and the results obtained as to the structure of the green mercury line given by an Arons lamp. The echelon spectroscope employed was arranged so that the auxiliary prism could be mounted next to the echelon. The dispersion of the prism may be added to or subtracted from the dispersion of the echelon, and the change in the dispersion obtained gives a method of determining whether two lines in the spectrum belong to the same order. Fabry and Perot spectra are produced by the secondary action of the echelon. When the echelon is tilted the secondary light may be separated from the primary, and parts of the Fabry and Perot circles observed with a wide slit.

The secondary light also undergoes the primary echelon treatment, and, with a narrow slit, is confined to the points of intersection of the two systems of spectra. When the echelon is in the ordinary position the secondary spectra are lines similar to the primary echelon lines, and may be observed moving across the broad central line when the echelon table is rotated slowly.—The proposed international unit of candle-power : C. C. **Paterson**. The paper discusses the units of candle-power at present officially accepted in Great Britain, France, the .United States of America, and Germany. The authorities in the gas and electric interests in the United States are prepared to adjust their units of candle-power to bring them to a single value, which is to be the same as the British and French units. The paper gives the results of comparisons showing that, within the limits of experimental error, the British and French units are identical. The change involved in the unit maintained at the Bureau of Standards, Washington, is 1·6 per cent. The Hefner unit is almost exactly nine-tenths of the new unit.—Inductance and resistance in telephone and other circuits : Dr. J. W. **Nicholson**. A general formula for the effective inductance of a circuit consisting of two long parallel wires has been given previously, and is suitable for cases in which the current distribution in either wire is affected greatly by the frequency of alternation. Important cases are examined in detail here, and formulæ are obtained capable of immediate use. A calculation of the effective resistance is also made in each case. Throughout the investigation only iron and copper wires as the two extreme cases are considered. The large permeability of iron completely changes the character of the effect of frequency on its self-induction. To all metals greatly used in practice, except iron, the formulæ developed for copper wires may be applied with a nearly identical order of accuracy.—Note on terrestrial magnetism : G. W. **Walker**.—The form of the pulses constituting full radiation or white light : A. **Eagle**.

PARIS.

Academy of Sciences, June 14.—M. Bouchard in the chair.—Some remarks on integral equations of the first species, and on certain problems of physical mathematics : Lmile **Picard**.—Some earthquakes which have devastated Provence and Dauphiné : G. **Bigourdan**. A chronological list of the earthquakes on record as happening in these districts between 1282 and 1812.—Presentation of three new sheets of the map of the edible molluscs of the coasts of France, established by M. Joubin : the **Prince of Monaco**.—Observations of the sun made at the Lyons Observatory during the first quarter of 1909 : J. **Guillaume**. Observations were made on forty-four days during the quarter ; the results are summarised in three tables, showing the number of spots, their distribution in latitude, and the distribution of the faculæ in latitude.—The latitude of the Observatory of Athens : D. **Eginitis**. A discussion of the cause of a systematic error of about 1·26″ in the meridian-circle readings.—Observation of the total eclipse of the moon of June 3, 1909, at the Observatory of Toulouse : L. **Montangerand**. A special photographic study of totality.—The pseudo-elliptic or hyperelliptic integrals of the form $\int^x \frac{x^p dx}{\sqrt{X_{2p+2}}}$: E. **Vallier**.
—A recent note of M. S. Bernstein : S. **Zaremba**.—Differential equations with fixed critical points : J. **Chazy**.—The study of the variations of statistical quantities : Émile **Borel**.—A law permitting the immediate calculation of the approximate profile of a watercourse of given flow when the section of the liquid and the wetted perimeter are algebraic functions of the height of the water : Philippe **Bunau-Varilla**.—The condensation of the radium emanation : A. **Laborde**. After condensing the emanation by cooling in tubes of copper, iron, tin, silver, glass, and silvered glass, the temperature at which the emanation was evolved was measured, and was found to be $-153°$ C. to $-155°$ C. for the four metals, $-175°$ to $-179°$ in glass. The absorptive properties of meerschaum, charcoal, platinum black, and spongy platinum for the emanation were also studied.—A new wave detector for wireless telegraphy and telephony : G. E. **Petit**. The detector consists

of a very fine conducting point resting with a fixed pressure on natural pyrites. It works without a battery, and has the advantage of not being injured by strong waves.—The observation, made parallel to the lines of force, of the unsymmetrical positions and intensities of the magnetic components of certain lines of emission: a new type of position dissymmetry: A. **Dufour.**—The physical origin of the evolution of electricity in chemical reactions: M. **de Broglie** and L. **Brizard.** The production of an electric charge in the cases studied is altogether independent of the chemical reaction.—The magnetic dichroïsm of the rare earths: Georges **Meslin.**—An arrangement for controlling signals at a distance with or without wires: M. **d'Ivry.** A detailed description with diagrams.—Comparisons between nitriles and carbamines: P. **Lemoult.** A thermochemical paper.—Some double sulphates of calcium: M. **Barre.** Owing to the formation of the double sulphate $CaSO_4.(NH_4)_2.SO_4.H_2O$, a salt which is stable between o° C. and 100° C. in presence of an excess of ammonium sulphate, the solubility of calcium sulphate is largely increased in the presence of ammonium sulphate. Similar results are obtained with potassium sulphate.—The metallic character of an organic group: R. **Fosse.** The pyryl group,

$$\left[C_{10}H_6 \underset{-O}{\overset{CH}{\diagdown}} C_{10}H_6 \right],$$
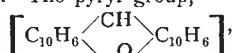
forms compounds which behave with mineral acids, picric acid, and sulphuretted hydrogen, in a manner strikingly resembling metallic salts. Pyryl bromide with hydrochloric acid gives pyryl chloride and hydrobromic acid; pyryl chloride is precipitated by hydrogen sulphide, pyryl sulphide forming the precipitate. Boiling hydrochloric acid acting on this sulphide regenerates the chloride, sulphuretted hydrogen being given off.—The action of cacodylic and methylarsinic acids on antimony trichloride: L. **Barthe** and A. **Minet.**—Aromatic alcohols and hydrocarbons derived from fenone: J. **Leroide.**—The β-naphthane diols: Henri **Leroux.**—Results of the geological and mineralogical exploration of Eguéï: G. **Garde.**—The extension in Chaouid of the *tirs*, or fertile lands of western Morocco: Louis **Gentil.**—The possibility of keeping animals alive, after complete ablation of the thyroid apparatus, by adding salts of calcium or magnesium to their food: Albert **Frouin.**—A method permitting the measurement of the dehydration of the organism by the lungs and the skin. The variations of this dehydration with altitude: H. **Guillemard** and R. **Moog.** The loss of weight of the body in unit time is smaller in the mountains than in the plains, and this is also the case with the amount of water eliminated.—Cardiac arythmia and d'Arsonvalisation: E. **Doumer** and G. **Lemoine.**—The treatment of intermittent claudication and of gangrene of the lower extremities by d'Arsonvalisation: A. **Moutier.**—Some biological properties of the *Bacillus endothrix*: Fernand **Guéguen.**—A new case of hermaphroditism in *Oersteidia rustica*: Mieczyslaw **Oxner.**—Demonstration of the existence of an artificial deformation of the skull at the Neolithic epoch in the Paris basin: Marcel **Baudouin.**—The geosynclinals of the chain of the Alps during Secondary times: Émile **Haug.**—The earthquake of June 11, 1909: Alfred **Angot.** This earthquake was completely registered by the seismograph at Parc Saint-Maur, and communications have been received from nine other observatories giving the times recorded.

DIARY OF SOCIETIES.

THURSDAY, JUNE 24.

ROYAL SOCIETY, at 4.30 (Meeting at the Royal Astronomical Society).— (1) On Pressure Perpendicular to the Shear Planes in Finite Pure Shears ; and on the Lengthening of Loaded Wires when Twisted ; (2) The Wave Motion of a Revolving Shaft, and a Suggestion as to the Angular Momentum in a Beam of Circularly Polarised Light: Prof. J. H. Poynting, F.R.S.—The Effect of a Magnetic Field on the Electrical Conductivity of Flame: Prof. H. A. Wilson, F.R.S.—Studies of the Processes Operative in Solutions. XI.—The Displacement of Salts from Solution by Various Precipitants: Prof. H. E. Armstrong, F.R.S., and Dr. J. V. Eyre.—Thermal Conductivity of Air and other Gases: George W. Todd.—The Possible Ancestors of the Horses living under Domestication: Prof. J. C. Ewart, F.R.S.—The Alcoholic Ferment of Yeast-juice. Part IV.—The Fermentation of Glucose, Mannose, and Fructose by Yeast-juice: Dr. A. Harden, F.R.S., and W. J. Young.—The Electrical Reactions of Certain Bacteria, and an Application in the

Detection of Tubercle Bacilli in Urine by Means of an Electric Current: Charles Russ.—The Effect of the Injection of the Intracellular Constituents of Bacteria (Bacterial Endotoxins) on the Opsonising Action of the Serum of Healthy Rabbits: Prof. R.T. Hewlett.—On the Occurrence of Protandric Hermaphroditism in *Crepidula fornicata*: J. H. Orton.—Sensitive Micro-balances, and a New Method of Weighing Minute Quantities: B. D. Steele and Kerr Grant.—The Polarisation of Secondary γ Rays: Dr. R. D. Kleeman.—On the Absorption of Homogeneous β Rays by Matter, and on the Variation of the Absorption of the Rays with Velocity: W. Wilson.—Experimental Researches on Vegetable Assimilation and Respiration. V.—A Critical Examination of Sachs' Method for Using Increase of Dry Weight as a Measure of Carbon Dioxide Assimilation in Leaves: D. Thoday.—And other Papers.

FRIDAY, JUNE 25.

PHYSICAL SOCIETY, at 5.—A Transition Point in Zinc Amalgam: Prof. Carhart.—A Method of Producing an Intense Cadmium Spectrum, with a Proposal for the Use of Mercury and Cadmium as Standards in Refractometry: Dr. T. M. Lowry.—On the Measurement of Wave-length for High Frequency Electrical Oscillations: A. Campbell.— An Electro-magnetic Method of Studying the Theory of and Solving Algebraical Equations of any Degree: Dr. A. Russell and J. N. Alty.— The Sine Condition in Relation to the Coma of Optical Systems: S. D. Chalmers.—Exhibition of a new Fery Thermo-electric Calorimeter: C. V. Drysdale.—An Instrument for Measuring the Strength of an Intense Horizontal Magnetic Field: F. W. Jordan.—On a Method of Determining the Sensibility of a Balance: Prof. Poynting, F.R.S., and G. W. Todd.—The Balance as a Sensitive Barometer: G. W. Todd.

MONDAY, JUNE 28.

ROYAL GEOGRAPHICAL SOCIETY, at 8.45 (In the Albert Hall).— Exploration in the South Polar Region: Lieut. E. H. Shackleton.

TUESDAY, JUNE 29.

ROYAL ANTHROPOLOGICAL INSTITUTE, at 8.15.—The Social Organisation of the Andamanese: A. R. Brown.

CONTENTS.